

# LARGE GASTROPODS OF THE FAMILIES DIASTOMATIDAE AND CERITHIIDAE (MOLLUSCA : GASTROPODA) IN SOUTHERN AUSTRALIA

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## Summary

The stratigraphical and geographical distribution of species of *Diastoma* (Miocene to Recent), *Campanile* (Miocene to Recent), *Jetwoodsia* (Eocene to Miocene), *Theridium* s.str. (Pliocene), *Theridium* (*Chavanicerithium*) (Lower Miocene to Pleistocene) in sedimentary basins of southern Australia are determined.

Three species of *Diastoma*, *D. adelaidense* Ludbrook sp. nov., *D. melanioides* (Reeve) and *D. provisi* Tate; three species of *Campanile*, *C. symbolicum* Iredale, *C. triseriale* Basedow and *C. virginense* Ludbrook sp. nov.; two species of *Jetwoodsia* gen. nov., *J. apheles* (Fenison Woods) and *J. nullarhorica* (Chapman & Crespin); *Theridium* (*T.*) *fallax* (Ludbrook), and eight species of *Theridium* (*Chavanicerithium*), *T.* (*C.*) *adelaidense* (Howchin & Cotton), *T.* (*C.*) *darraghi* Ludbrook sp. nov., *T.* (*C.*) *flemingtonense* (McCoy), *T.* (*C.*) *pritchardi* (Harris), *T.* (*C.*) *tatei* Ludbrook sp. nov., *T.* (*C.*) *torri* (Tate), *T.* (*C.*) *westralense* Ludbrook sp. nov. and *T.* (*C.*?) *wynyardense* (Tate) are described or noted.

## Introduction

Middle and late Cainozoic molluscan assemblages in the limestones and sandy limestones of the Eucla and St. Vincent Basins characteristically contain large bivalves, mostly *Miltha* and *Anodontia*, and gastropods *Campanile* and *Diastoma*, often only in the form of casts and moulds. Over a period of some ninety years rocks containing these genera have been correlated with one another, first as of Miocene age, and more recently as Pliocene.

It is now known that the association began in the Miocene of the Eucla and St. Vincent Basins, flourished in the late Pliocene of the St. Vincent Basin and early Pleistocene of the Eucla Basin, with the gastropods surviving in present seas of the western part of the Flindersian Province of southern Australia. Systematic revision of the large gastropods became necessary during a monographic study of Pleistocene molluscs from the Roe Plain at the western end of the Eucla Basin. Rich collections have recently been made along the Eyre Highway and from foundation holes excavated for the Hampton Microwave Repeater Tower site, 33 miles (53 kilometres) east of Madura.

The molluscan assemblage containing *Miltha* first appears in the Nullarbor Limestone (Ludbrook 1969), the Melton Limestone near Wallaroo, northern Yorke Peninsula, and the limestones at Deep Creek, 20 miles (32 kilo-

metres) south-west of Whyalla, Whyalla 1: 250,000 geological sheet (Lindsay 1970), all of Miocene age. Great care must be exercised in assessing the stratigraphical position of rocks containing the *Diastoma-Campanile-Anodontia-Miltha* assemblage since some of the species such as *Diastoma adelaidense* and *Anodontia sphericula* are long-ranging and only the accompanying molluscs and foraminifera and the lithology will distinguish the Miocene from the Pliocene limestones.

From field observations and study of the microfaunas and lithologies, Lindsay (1970) has shown that limestone outcrops on northern Yorke and Eyre Peninsulas are of Miocene age, and not Pliocene as previously recorded, particularly by the present writer. Limestones of Miocene age in the Eucla Basin and those south of Whyalla and at Wallaroo and Tickera which have been recorded as Pliocene or correlated with units now known to be of Pliocene age are: the crystalline limestones at Tickera (Melton Limestone) and "Bunda Cliffs marbles" (Nullarbor Limestone) correlated by Tate (1879a, p. liii) with the "Upper Aldinga Series" (i.e. the Hallett Cove Sandstone); samples S1 and S3 from the surface near Koonalda, Abrakurrie and Weebubbie Caves determined by Crespin (*in* King 1949, p. 57) as Lower Pliocene, but presumably as Sample S2 from the Nullarbor Limestone; at the foot of Poynton Scarp and in Deep Creek (Miles

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1952, p. 96, pl. VII; Cotton *in Miles* 1955, p. 25; and Ludbrook *in Miles* 1955, p. 25); localities 2 and 3 of Ludbrook (1959, p. 220; 1963, fig. 1; 1967a, fig. 3); and of Crawford (1965, p. 36)—“6 feet of nodular limestone of Pliocene age near Wallaroo and Point Hughes”.

#### Acknowledgements

Material used in this study is in the collections of the Department of Geology, University of Adelaide (AUGD), Geological Surveys of South Australia (GSSA) and Western Australia (GSWA), Western Australian (WAM) and South Australian (SAM) Museums, and

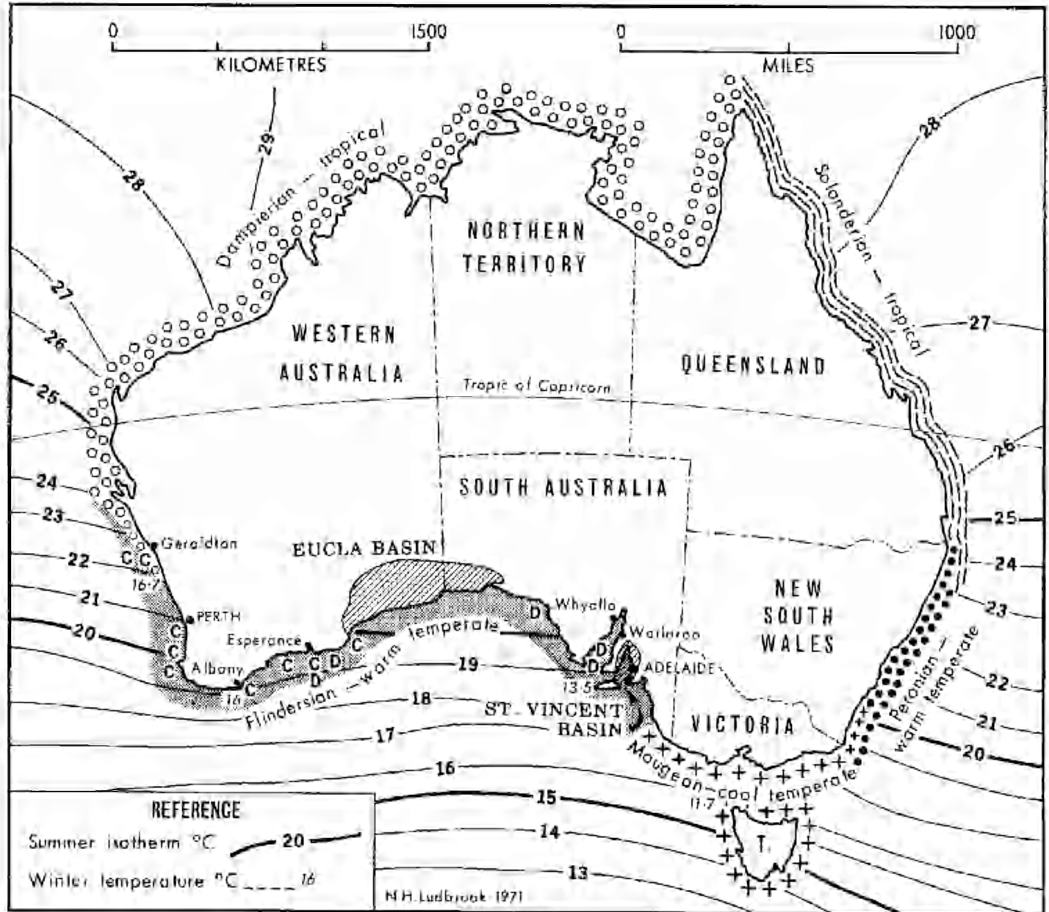


Fig. 1. Australian littoral provinces and the distribution of *Diastoma* (D) and *Campanile* (C).

Figure 1, showing the present distribution of *Campanile* and *Diastoma*, incorporates isothermal data adapted from charts of Sverdrup, Johnson and Fleming (1942) and of the Royal Netherlands Meteorological Institute (1949), and shows the littoral biogeographical provinces of Bennett and Pope (1953, p. 139). *Diastoma* and *Campanile* are now restricted to the Flindersian Province, partly equivalent to Crespin's (1950) Austral Indo-Pacific Province (Ludbrook 1959a). The Eucla and St. Vincent Basins fall within this province.

the National Museum of Victoria (NMV). The assistance given by the Director of Mines, South Australia, Director of the Geological Survey of Western Australia, Dr. Helene Laws of the South Australian Museum, Dr. Mary Wade of the University of Adelaide, and Mr. T. A. Darragh of the National Museum of Victoria, in making the material available is gratefully acknowledged. To Mr. G. Kendrick of the Western Australian Museum, particular thanks are due for his help in many ways, including the provision of the photograph on

Plate 3, figure 5. Mr. Richard Carver donated the specimen of *Campantele symbolicum*, M3231.

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Family **DIASTOMATIDAE** (emend. pro  
**DIASTOMIDAE**)

Genus **DIASTOMA** Deshayes, 1850

*Diastoma* is best known from the Eocene of the Paris Basin; it is now living only in a very restricted area in south-western Australia and off Eyre Peninsula in South Australia. The genus has been recorded (Wenz 1940, p. 750), as having a range of Upper Cretaceous (Senonian) to Recent, and occurring in Europe, Egypt, East Indies, North and South America, and Australia. However, small cerithiids such as those described from Southern California as *Diastoma fastigiata* Carpenter, *D. oldroydae* Bartsch, and *D. stearnsi* Bartsch (Bartsch 1911; Oldroyd 1927) and three cerithioid species from the Eocene of Peru, *D. geositta* Olsson, *D. furnaria* Olsson, and *D. elaeina* Olsson, placed doubtfully in *Diastoma* by their author, appear from the figures to differ from *Diastoma* in style of sculpture and in the possession of a broad siphonal canal, as also does *D. virginica* Henderson & Bartsch, of which the South Australian Museum has specimens in the Elliot Collection.

From advice and material received from Cossmann, Tate (1894) was able to affirm that his *Diastoma provisi*, *Mesalia melanioides* Reeve ("melanioides" Tate, error for *melanioides*) and *Diastoma costellatum* Lamarck, the type species of *Diastoma*, were congeneric, and that *Diastoma* was present in the South Australian Pliocene and living in southwestern Australia. The distribution and evolutionary history of the genus have been subsequently obscured by the introduction of a separate genus for *D. melanioides*.

The genus *Diastoma* was described in considerable detail by Deshayes (1864) from four species—*D. costellata*, *D. variculosa*, *D. interrupta* and *D. inermis* from the calcaire grossier, sables moyens and sables inferieurs of the Paris Basin. Harris (1897) briefly but adequately described the generic characters as:

"Shell turriculate, varicose, with a high spire; aperture ovate, oblique, canaliculate and detached behind, sinuous, but not canaliculate in front; columella slightly concave, covered by a thin, shining and somewhat detached plate or an affixed callosity, and carrying, towards

the middle, an oblique plication not always well marked."

*Diastoma* was placed in the Cerithiidae by Fischer (1884) and by Cossmann (1889).

Cotton (1932) introduced the genus *Neodiastoma* for the Recent shell *Mesalia melanioides* Reeve, the aperture of which was described as being "oblique, inner lip glazed, more thickly glazed anteriorly, the two degrees of glazing separated by a sharp columella plait; outer lip slightly notched anteriorly near the columella, . . . *Neodiastoma* differs from *Diastoma* in the anterior notch of the outer lip, and from *Mesalia* in being variced. . . . This genus had probably better be placed in the Family Cerithiidae for the present."

Wenz (1939), reproducing Reeve's figure of *Mesalia melanioides* showing no anterior notch, placed *Neodiastoma melanioides* (Reeve) in the Turritellidae near *Mesalia*, and *Diastoma* (type species *Melania costellata* Lamarck) in a separate family Diastomidae with *Sandbergeria* and several other genera of small shells such as *Obiortia*.

The close relationship between the Pliocene *D. provisi* and the Recent *N. melanioides* prompted Ludbrook (1941), Cressin in King (1949), and Cotton (1952) to list *D. provisi* in *Neodiastoma*.

Cossmann's early opinion was confirmed by Chavan in 1952 in correspondence with the writer: "*Neodiastoma provisi* that I have received from you belongs to *Diastoma sensu stricto*; this is not a *Neodiastoma* according to the characteristics of this unit." Ludbrook (1957) redescribed and figured *D. provisi* as a "restricted and typical fossil of the Dry Creek Sands and their equivalents". While this statement still applies to *D. provisi*, it is now obvious from the more abundant material available that *Diastoma* has been present in southern Australia in the Eucla and St. Vincent Basins from Lower Miocene to Recent times, reaching its maximum abundance in the late Pliocene and early Pleistocene, and that *Neodiastoma* is a synonym of *Diastoma*.

Although the species appears to be rare and very restricted in its present distribution, topotypes of *D. melanioides* do not exhibit any more conspicuous anterior notching of the outer lip than does *D. costellatum*, as is demonstrated by the specimens figured on Plate 1. Cotton appears not to have noticed the broken apertures of some of the specimens on which he based his diagnosis of *Neodiastoma*, one of which is illustrated in figure 18. *D. melanioides* usually lacks the tendency

for the aperture to separate at the suture, but it may be present to a slight degree (figure 13). The median folding of the columellar lip is a common feature of all the species here placed in *Diastoma*.

Three species are recognized. *D. adalaidense*, the longest ranging, first appearing in the Lower Miocene Nullarbor Limestone and the youngest member of the Melton Limestone of Yorke Peninsula and its equivalents on Eyre Peninsula, and dying out in the Pleistocene of the Roe Plain; *D. provisi*, common in the Dry Creek Sands but restricted to the Upper Pliocene; and *D. melanioides*, abundant in the Pleistocene of the Roe Plain and surviving in a very restricted area between Cheyne Beach, 50 miles (80 km) NE of Albany, and Duke of Orleans Bay, 275 miles (443 km) ENE of Albany, and also at depths of less than 20 fathoms (37 m) off islands off the coast of Eyre Peninsula.

***Diastoma adalaidense* Ludbrook sp. nov.**

PL. 1, FIGS. 3-7; PL. 6, FIGS. 9, 10.

*Diastoma provisi* Ludbrook, 1957: 22 (in part); 1959: 221 (in part) (*non* Tate).

Shell of moderate size and thickness, elongate, turreted, with a small dome-shaped protoconch of one-and-a-half turns, adult whorls 14, all more or less variced, often with three strong varices per whorl; whorls obliquely axially plicate, with from 15 to 20 plicae per whorl, surmounted by fine spiral lirae increasing from 3 in the early whorls to about 20 in the penultimate whorl, with fine secondary lirae between them; suture deep, imbricating; aperture oblique, loop-shaped, with a short adapical channel, columellar lip thickened and divided medially by a sharp thin columellar fold, reflexed anteriorly to the basal lip which is broadly reflected in a slight siphonal canal. *Dimensions*: height 48, diameter 14 mm.

*Types*: holotype GSSA M 609, Mitchell's Bore, sec. 353, hd. Yatala, 420-499 feet (127-151 m); paratype GSSA M 611, Koo-yonga Golf Club Bore 1932, sec. 2028, hd. Adelaide, 390-478 feet (118-145 m); WAM 69.487 Hampton Microwave Repeater Tower site.

*Type locality*: Mitchell's Bore, sec. 353, hd. Yatala, 420-499 feet (127-151 m), Adelaide Plains Sub-Basin, St. Vincent Basin, Dry Creek Sands, Upper Pliocene.

*Material*: 253 specimens from sludges from depths varying from 238 to 507 feet (72-154 m) of 21 bores, in the Adelaide Plains Sub-Basin between West Beach and Salisbury,

drilled into the Dry Creek Sands; 11 specimens WAM 69.487 from the Pleistocene of the Roe Plain at Hampton Microwave Repeater Tower; external moulds in sandy limestone on Kangaroo Island, 11 miles (17 km) WSW of Kingscote, sec. 268, hd. Menzies; external moulds from the Melton Limestone at Wallaroo, Port Hughes, and 1 mile (1.61 km) NE of Myponie Point on Yorke Peninsula and from Deep Creek and Murninnic on NE Eyre Peninsula.

*Stratigraphical range*: Lower to Middle Miocene of the Melton Limestone to Pleistocene of the Roe Plain (Eucla Basin) in Western Australia.

The species resembles *Diastoma hypermecees* Cossmann from the Oligocene of Rennes. It may be readily distinguished by the relatively few axial plicae per whorl and by its tendency to be strongly varicate; it has the longest range and is the most widely distributed *Diastoma* in southern Australia.

***Diastoma melanioides* (Reeve).**

PL. 1, FIGS. 12-21.

*Mesalia melanioides* Reeve, 1849: pl. *Mesalia*, fig. 3, sp. 3.

*Diastoma melanioides* (err. pro *melanioides*) Reeve; Tate, 1894: 177.

*Mesalia exilis* Sowerby, 1913: 236, pl. iii, fig. 9.

*Neodiastoma melanioides* Reeve; Cotton, 1932: 541.

Shell of moderate size, turreted, with a protoconch of 2 smooth whorls; adult whorls 12 in a height of 42 mm, early whorls rather irregularly variced, the varices becoming obsolete towards the last whorl; the first two adult whorls are finely spirally liriate, the number of lirae increasing from 6 on the first two whorls to 12 primary and numerous secondary lirae over the last whorl and base; third and following whorls axially plicate, with about 30 plications on each whorl weakly tuberculated at the intersections with the primary spiral lirae; suture linear, imbricating, base rounded.

Aperture oblique, loop shaped, with an adapical channel, outer lip thin, basal lip reflected anteriorly towards the columella; columellar lip with 2 distinct calloused areas divided by a sharp columellar fold; the anterior part is reflected to the basal lip which is reflected or has a slight broad shallow siphonal canal.

Colour white, flecked with chestnut spots on the spiral ribs.

*Dimensions*: height 42, diameter 14 mm.

*Types*: hypotypes WAM 70.1145, Esperance; SAM D 14994, 14995, 14997 Esperance; D 14996 St. Francis Island, South Australia. WAM 70.1088, 0.4 miles (0.65 km) north of Hampton Microwave Repeater Tower; GSWA F 6920 (1-3), 13 miles (21 km) northeast of Eyre.

*Type locality*: Esperance, Western Australia.

*Material*: 7 topotypes and 19 other specimens from localities in southwestern Australia and off Eyre Peninsula; 310 specimens from 16 localities in the Pleistocene of the Roe Plain. *Stratigraphical range*: abundant in the Pleistocene of the Roe Plain, rare in Recent shallow water to 20 fathoms (37 m).

*Geographical Distribution*: In the Pleistocene of the Eucla Basin from 38 miles (61 km) east to 4 miles (6.5 km) southwest of Madura; Recent, Esperance, Cheyne Beach, and Duke of Orleans Bay in Western Australia; St. Francis Island in the Nuyts Archipelago, South Australia. Cotton (1932) recorded the species also from Thistle Island, Spencer Gulf, Sir Joseph Banks Island and Petrel Bay.

#### *Diastoma provisi* Tate.

PL. 1, FIGS. 8-11.

*Diastoma provisi* Tate, 1894: 177, pl. x, fig. 6; Ludbrook, 1957: 22 (in part), pl. 1, fig. 4 (synonymy); Ludbrook, 1969b: Fig. 96, 12.

Shell thick, solid and heavy, large and broad for the genus, protoconch of 2½ high, convex, smooth whorls, adult whorls 12 in a height of 46 mm, usually without varices, sculptured with fine somewhat sinuous oblique axial plicae, about 40 per whorl, crossed by from 5 in the early whorls to about 24 spiral lirae in the last whorl and base. Aperture oblique, loop-shaped; outer lip thin, incurved posteriorly, columellar lip calloused, the posterior callus thin, the anterior callus separated from the posterior by a thin sharp columellar fold, which is accentuated in the adult; basal lip reflected.

*Dimensions*: height 46, diameter 14 mm.

*Types*: holotype T 1541B and hypotypes T 1541 E.G on tablet T1541A-P all from Dry Creek Bore; GSSA M2727.

*Type locality*: Dry Creek Bore, sec. 980, hd. of Port Adelaide, 320-400 feet (97-121 m); Dry Creek Sands.

*Material*: 357 specimens from sludges from 6 bores in the Adelaide Plains Sub-Basin between Kooyonga Golf Links and Two Wells, drilled

into the Dry Creek Sands. Moulds in limestone from the Pliocene of Wardang Island and Redhanks on the River Light, sec. 5, hd. Grace.

*Stratigraphical range*: Upper Pliocene of the Dry Creek Sands and Hallett Cove Sandstone and of Wardang Island, south tip.

*D. provisi* is a heavy thick shell with 40 axial plicae per whorl in contrast with about 30 in *D. melanioides* and from 15 to 20 in *D. adalaidense*. It is very rarely varicose.

#### Family CERITHIIDAE

Genus CAMPANILE: Bayle in Fischer, 1884

A geographical and stratigraphical distribution map of *Campanile* was published by Wrigley (1940); its present distribution in Australian waters is shown on Figure 1.

#### *Campanile symbolicum* Iredale.

PL. 2, FIGS. 1-7.

*Cerithium leve* Quoy & Gaimard, 1834: 106, pl. 54, figs. 1-3 (non *Cerithium laevis* Perry, 1810).

*Campanile symbolicum* Iredale, 1917: 326, nom. nov. for *Cerithium leve* Quoy & Gaimard; Wrigley, 1940: 111; Cotton, 1950: 337; Hodgkin et al., 1966: 41, pl. 15, fig. 6.

Shell large, thick, subulate, concave in profile, whorls numerous, about 30 in a height of 140 mm, flat except for slight constriction at the sutures; sutures imbricating; the first about 20 whorls sculptured with 2 spiral cords one at the abapical suture and a second immediately above it, below the adapical suture the whorl is weakly gemmulate; the spiral sculpture becomes obsolete in the adult whorls which are smooth except for sinuous axial growth striae faintly crossed by microscopic irregularly waving spiral striae; last whorl one-sixth height of shell, roundly angulate at the periphery, base moderately convex; aperture relatively low and narrow, about one-quarter of area of last whorl, subrectangular, slightly oblique, outer lip thin, columella concave, siphonal canal short, reflected, deep.

*Dimensions*: WAM 69.384 height (estimated) 140, diameter 47 mm. Recent and Pleistocene shells are as large as 200 mm high.

*Types*: holotype Mus, nat. Hist. Paris; hypotypes WAM 69.384, Pleistocene, 25 miles (40.25 km) east of Madura; WAM 61.54 (b) Pleistocene, 20 miles (32.2 km) east of Madura; GSSA M2564 Pleistocene, Madura Cave; M3231 Pleistocene, 0.4 miles

(0.6 km) north of Hampton Microwave Repeater Tower; M 3239, Recent, Israelite Bay; M 3240 Pleistocene, Madura Cave.

*Type locality*: King George Sound, Albany, Western Australia.

*Material*: 33 specimens from Rockingham, Geraldton, Israelite Bay, and other localities between Esperance and Geraldton; 55 specimens from 9 localities in the Pleistocene of the Eucla Basin.

*Stratigraphical range*: Pleistocene of the Roe Plain to Recent.

*Geographical distribution*: Pleistocene of the Roe Plain from 36 miles east of Madura to 4 miles (6.44 km) southwest of Madura; Recent, sublittoral, sandy bottoms, Recherche Archipelago to Geraldton (Hodgkin et al 1966).

*Shell structure*: Wrigley (1940, p. 99) described the unusual shell structure of *Campanile cornucopiae* (J. Sowerby) revealed by erosion of the shell: "On the inside there are two thick lamellar layers . . . next come two thinner compact layers and a thin outer layer of spongy substance. . . . The whole surface is pitted by minute holes arranged on incised lines." Fossil specimens of *C. symbolicum* and some Recent specimens have similar structures, shown on Plate 2, figures 1, 2, 6, 7. Erosion of the surface of GSSA M 3231 shows clearly a pitted layer and a thick cellular layer beneath it (Pl. 2, fig. 7). Unlike those attributed to *C. cornucopiae*, the pittings are for the most part irregular, although there are some on incised lines. The section through GSSA M 3240 (Pl. 2, fig. 6) shows the apparent cellular structure of the shell, but the fact that it extends to the columella and that the section through the Recent specimen GSSA M 3239 (Pl. 2, fig. 2) shows only partial boring indicate that the cellular structure is not a primary feature but is produced by boring organisms. This type of boring is usually attributed to small sponges.

#### *Campanile triseriale* Basedow

PL. 3, FIGS. 1, 4.

*Campanile triseriale* Basedow, 1902: 130, pl. 2, fig. 1; Ludbrook, 1959: 231, pl. 5, figs. 2, 3, 4.

This species, with its three rows of spiral tubercles, is known only from the Upper Pliocene Hallett Cove Sandstone at Hallett Cove and O'Sullivan Beach and its equivalents at Edithburg and on section 140, hd. Moorowie, Yorke Peninsula, and the Dry Creek Sands of the Adelaide Plains Sub-Basin.

#### *Campanile virginiae* Ludbrook sp. nov.

PL. 3, FIGS. 2, 3.

Shell large, subulate, whorls numerous, estimated about 25 in a height of 150 mm, prominently sculptured with an adapical band of large tubercles, 20 per whorl, and an abapical band of small tubercles, about 26 per whorl, between and over which are numerous spiral threads, those on the adapical three-quarters of the whorl being regularly spiral and those on the abapical one-quarter undulating and interrupted by the axial growth striae; there is a conspicuous spiral striation separating the discrepant sculptures. Last whorl low, about one-fifth height of shell, aperture oblique, small, subrhomboid, outer lip thin, columella concave, thinly calloused with a fold at the base bordering the short deep siphonal canal.

*Dimensions*: holotype height (estimated) 156, diameter 47 mm; paratype GSSA M2013 indicates that the species must grow to a height of about 200 mm, diameter about 60 mm.

*Types*: holotype GSSA M 2360 Adelaide Plains Observation Bore A, Virginia; paratype GSSA M 2013, bore of F. Virgin, sec. 3224, hd. Munno Para, 238-350 feet (102-106 m).

*Type locality*: Adelaide Plains Observation Bore A, Virginia, sec. 3036, hd. Munno Para, 209-217 feet (63.3-65.8 m), Dry Creek Sands.

*Distribution*: Upper Pliocene of the Dry Creek Sands in the Virginia area.

*C. virginiae* is readily distinguished from *C. triseriale* by its one band of large and one band of small tubercles.

#### *Campanile* sp.

PL. 3, FIG. 5.

Casts and moulds of *Campanile* sp. in Nullarbor Limestone have been collected from railway ballast quarries on the Transcontinental Railway line at Watson, Naretha, Forrest and Loongana, and from GSWA localities 14265, Warbla Cave, and 12694C. "50-mile Claypan".

The "large species of *Cerithium* probably referable to the subgenus *Campanile* from Kadina, South Australia" (Harris 1897, p. 228) is probably the same species from the Melton Limestone.

The species attains the same height of 200 mm as *C. symbolicum*, but the shell itself is unknown.

*Type*: WAM 10448, Forrest, Western Australia, Nullarbor Limestone.

Genus **THERICIUM** Monterosato, 1890.

Subgenus **THERICIUM** s.str.

**Thericium (Thericium) fallax** (Ludbrook).

PL. 6, FIGS. 6, 7.

*Terebralia fallax* Ludbrook, 1941: 91, pl. 4, fig. 21.

*Thericium (Thericium) fallax* (Ludbrook), 1957: 28, pl. 1, fig. 5.

Only one species of the genus, with erect, angular plications and prominent spiral threads, occurs in the Cainozoic of southern Australia. It is known from some 88 specimens from 7 bore holes entering the Upper Pliocene Dry Creek Sands of the Adelaide Plains Sub-Basin.

*Types*: holotype AUGD T 1621, Abattoirs Bore; hypotypes AUGD F 15177 Pecze's Bore sec. 4251, hd. Munno Para, and GSSA M 2730, De Ruro Bore sec. 4259, hd. Munno Para.

Subgenus **CHAVANICERITHIUM** Ludbrook, 1957.

The subgenus, with type species *Terebralia adelaidensis* Howchin & Cotton, has a long range in the Cainozoic basins of southern Australia. The earliest representative is *Thericium (Chavanicerithium) pritchardi* (Harris) from the Lower Miocene (Longfordian) of Table Cape, Tasmania, and the latest are the two new species *T. (C.) darraghi* and *T. (C.) westraliense* Ludbrook from the Pleistocene of the Roe Plain. The affinities of *T. (C.) pritchardi* with the European Eocene *Cerithium (Vulgocerithium) semicostatum* Deshayes were noted by Harris (1897, p. 224); *Vulgocerithium* is a synonym of *Thericium*. The diagnostic features distinguishing *Chavanicerithium* from *Thericium* s.str. have been described (Ludbrook 1957, p. 30).

**Thericium (Chavanicerithium) adelaidense** (Howchin & Cotton).

PL. 4, FIGS. 7, 8.

*Cerithium* sp. Howchin, 1935: 90.

*Terebralia adelaidensis* Howchin & Cotton, 1936: 31, pl. 1, figs. 1, 2; Ludbrook, 1941: 100.

*Campanile adelaidensis* Howchin & Cotton; Cotton, 1952: 245.

*Thericium (Chavanicerithium) adelaidense* (Howchin & Cotton); Ludbrook, 1957: 29, pl. 1, fig. 3.

The species, restricted to the Upper Pliocene Dry Creek Sands of the Adelaide Plains Sub-Basin, is known from 22 specimens from 10

bore holes between the western suburbs of Adelaide and Salisbury. It has been fully described previously.

*Types*: holotype, SAM D 12852, Glanville Bore, 375-400 feet (113-121 m); hypotypes AUGD F 15178, Hindmarsh Bore, 450-485 feet (136.5-147 m); GSSA M 765A Cowandilla Bore, 485-507 feet (147-154 m); M 643 Kooyonga Bore 1932, 491-501 feet (149-152 m).

**Thericium (Chavanicerithium) darraghi** Ludbrook sp. nov.

PL. 5, FIGS. 7, 8.

Shell of moderate size, solid, elongate-conical, apical angle 17°, profile slightly convex, protoconch high, apparently of 3 turns, adult whorls 12 in a height of 53 mm, whorls convex, sculptured with slightly curved axial ribs increasing in number from 15 on the early whorls to 21 on the penultimate whorl, crossed by spiral threads of which there are 5 on the early whorls, the adapical 2 being finer and set in a constricted band below the suture, the abapical three producing weak tubercles on the axial ribs; finer secondary threads develop between the primary threads on succeeding whorls. Last whorl about two-fifths height of shell, base convex with about 5 irregularly spaced striae.

Aperture oblique, subovate, with a conspicuous parietal ridge on the parietal lip and a well-marked adapical channel, columellar lip smooth, outer lip thickened, siphonal canal deep.

*Dimensions*: WAM 69.457 height (estimated) 53, diameter 18 mm.

*Types*: holotype WAM 69.457.

*Type locality*: 0.4 miles (0.64 km) north of Hampton Microwave Repeater Tower, 33 miles (53 km) east of Madura, Western Australia.

*Material*: the holotype and 16 other specimens from the type locality and from Nurinu and Madura Caves.

*Stratigraphical range*: Pleistocene of the Roe Plain, Eucla Basin.

Compared with *T. (C.) westraliense* this is a less attenuated shell with convex whorls, the axial ribs are stronger and fewer than those of *westraliense*; the spiral threads are fewer and not separated by incised striae on the later whorls.

**Thericium (Chavanicerithium) flemingtonense** (McCoy).

PL. 4, FIGS. 5, 6, 9, 10.

*Cerithium flemingtonensis* McCoy, 1876: 28, pl. XXVI, figs. 3-9.

*Cerithium flemingtonense* McCoy; Harris, 1897: 226; Gill & Baker, 1955: 40, pl. 1, figs. 3, 4.

Shell large, elongate-conical, spire angle about 25°, whorls about 15 in a height of 85 mm, flat, constricted just above the middle, sculptured with from 12 to 20 slightly sigmoidal primary axial ribs, more numerous on the early whorls, prominent in the abapical part of the whorl and abruptly cut off or rendered obsolete at the adapical constriction; between the primary ribs and continuing to the adapical suture there are numerous fine sigmoidal axial growth folds and on the early whorls an occasional varix; axial sculpture crossed by numerous spiral striae. Base convex with from 5 to 10 unequal spiral lirae. Aperture oval, columella concave, parietal lip with a parietal ridge, siphonal canal short.

*Dimensions*: height (estimated) 87, diameter 31 mm.

*Types*: syntypes NMV P 12141 A, B (figs. 3, 5), P 12142 (fig. 7), P 12146 (fig. 9), P 12145 (fig. 6); hypotypes NMV P 16831 (figured Gill & Baker, 1955); P. 27981-4; GSSA M 3234.

*Type locality*: Flemington, Melbourne, Newport Formation.

*Material*: 5 latex casts from the Newport Formation at Flemington and West Essendon (Aberfeldie); 3 latex casts from Melton Limestone, old flux quarry, Wallaroo.

*Stratigraphical range*: Lower to Middle Miocene of the Newport Formation, Melbourne District, Victoria, and youngest member of the Melton Limestone of northern Yorke Peninsula, South Australia.

***Theridium* (*Chavanicerithium*) *pritchardi* (Harris).**

PL. 4, FIGS. 1-4.

*Potamidex semicostatum* Tate, 1885: 226, non *Cerithium semicostatum* Deshayes; Pritchard, 1896: 116.

*Cerithium pritchardi* Harris, 1897: 225, pl. 7, fig. 3 (nom. nov. for *Potamidex semicostatum* Tate non *Cerithium semicostatum* Deshayes).

*Theridium* (*Chavanicerithium*) *pritchardi* (Harris); Ludbrook, 1957: 30; Ludbrook, 1967b: 67, pl. 4, fig. 15.

(Description slightly modified from Harris, 1897.) Shell large, solid, elongate-conical, tapering, of 12 slightly convex to flat whorls

much widened abapically; suture undulating, slightly incised; sculptured with strong, distant, elevated, rather oblique obtuse costae extending over the abapical half of the whorls only, 10 to 11 on the penultimate whorl, the whole surface of the whorls covered by close, irregular, spiral striations, interrupted by very fine growth corrugations which in the adult whorls may border the adapical sutures as fine obsolete tubercles; last whorl with a large variciform swelling.

Aperture oblique, ovate, columella concave, columellar lip thick, narrow, reflected over the columella, outer lip expanded, slightly thickened, a conspicuous parietal ridge and narrow deep adapical channel, siphonal canal deep, strongly reflected.

*Dimensions*: height 110, diameter 33 mm; AUGD F 15482 from the Bookpurnong Beds has an estimated height of 120 mm.

*Types*: holotype, Tasmanian Museum, Hobart, B 83; hypotypes British Museum (Natural History) G 9491, AUGD T 356, F 15482, F 15488.

*Type locality*: Table Cape, Tasmania; Table Cape Group, Freestone Cove Sandstone, Longfordian, Lower Miocene.

*Material*: 10 topotypes; one specimen from Bookpurnong Beds, AUGD F 15482.

*Stratigraphical range*: Lower Miocene (Longfordian) of Table Cape to Lower Pliocene (? Upper Miocene) of the Bookpurnong Beds.

***Theridium* (*Chavanicerithium*) *tatei* Ludbrook sp. nov.**

PL. 5, FIGS. 3, 4.

*Theridium* (*Chavanicerithium*) *torri* Ludbrook, 1957: 30 (in part), pl. 1, figs. 1, 2 (not of Tate, 1899); 1969b: fig. 96, 13.

Shell of moderate size for the genus, solid, elongate-conical, whorls slightly convex, constricted in the adapical one-third, sutures imbricating; sculptured with from 11 to 15 oblique and slightly curved axial ribs per whorl; in the early whorls the ribs are uninterrupted but in the middle whorls are first interrupted by the adapical constriction and in the last 3 whorls are broken into three or four rows of tubercles; the whole surface is microscopically spirally lirate in the early whorls but the lirae weaken and are replaced by faint spiral striae and numerous microscopic axial growth striae in the later whorls; early whorls usually varicose, a large variciform swelling in the last whorl; base short, convex, spirally lirate. Aperture oval, columella concave, columellar lip calloused and reflected



over the columella with a well-marked parietal ridge and adapical channel; siphonal canal short, reflected.

*Dimensions*: height 80, diameter 21 mm.

*Types*: holotype GSSA M 3224, hypotypes AUGD F 15175, F 15176.

*Type locality*: Adelaide Plains Observation Bore A, Virginia, sec. 3036, hd. Munno Para, 209-217 feet (63.3-65.8 m), Dry Creek Sands, Upper Pliocene.

*Material*: 90 specimens from 14 borings entering the Dry Creek Sands of the Adelaide Plains Sub-Basin.

*Stratigraphical range*: Upper Pliocene of the Dry Creek Sands.

*T. (C.) tatei* is a smaller shell with fewer axial ribs than *T. (C.) torri*.

### ***Theridium (Chavanicerithium) torri* (Tate).**

PL. 5, FIGS. 1, 2.

*Cerithium torri* Tate, 1899: 109, pl. 1, fig. 2 (not *Theridium (Chavanicerithium) torri* Ludbrook, 1957: 30, pl. 1, figs. 1, 2; 1969b: Fig. 96, 13).

Shell large, solid, elongate-conical, whorls flat, sculptured with 25 moderately sigmoidal axial costae interrupted by a constriction in the adapical one-third of the whorl; in later whorls the costae tend to become nodulose in as many as 3 spiral bands, the whole surface finely sculptured by microscopic spiral striae and axial growth striae; suture imbricating. Aperture oval, not completely known as the outer lip is broken in the two specimens, columella concave, a weak parietal ridge and an adapical channel; siphonal canal short, reflected.

*Dimensions*: holotype height (estimated) 120, diameter 31 mm; paratype height (estimated) 140, diameter 31 mm.

*Types*: holotype AUGD T 1618, paratype AUGD T 832.

*Type locality*: "River Murray Desert", i.e. Bookpurnong Beds, probably from boring at Mindarie, South Australia. In the table (1899, p. 104), Tate records both *C. torri* and *C. pritchardi* from Tareena, New South Wales. Since the tablets T 832 and F 15482 on which these are mounted are similar and the age of both given as Eocene? it may be assumed that T 832 came from Tareena. T 1618 is differently mounted and the age given as Post-Eocene; it may be assumed that the holotype T 1618 is from Mindarie.

*Material*: the holotype and paratype only, both

from borings in the Murray Basin penetrating the Bookpurnong Beds, the characteristic lithology of which is confirmed by matrix in the apertures of the two specimens.

*Stratigraphical range*: Lower Pliocene (?Upper Miocene) of the Bookpurnong Beds, Murray Basin.

### ***Theridium (Chavanicerithium) westraliense* Ludbrook sp. nov.**

PL. 5, FIGS. 5, 6.

Shell of moderate size, but rather small for the genus, solid, elongate-conical, apical angle  $15^\circ$ , with 15 adult whorls in a height of 71 mm, early whorls convex, later whorls flat to slightly convex, sculptured in the early whorls with about 10 axial ribs on the abapical part, which become weaker and more numerous in the later whorls; the axial ribbing is discrepant between the adapical and abapical parts of the whorl, in the earlier adult whorls the ribs are more numerous in a constricted band about one-quarter the width of the whorl immediately below the suture; in the later whorls additional ribs rise in the abapical one-third between the primary ribs which become more oblique and sinuous, about 30 on the penultimate whorl, crossed by spiral threads which are convex in the early whorls and flat in the later whorls, separated by linear striae; the axial ribs produce slight undulations on the linear sutures.

Aperture oblique, subovate, with a conspicuous parietal ridge on the parietal lip and a well-marked adapical channel; columellar lip smooth, outer lip thickened, siphonal canal deep, strongly reflected.

*Dimensions*: height 71, diameter 18 mm.

*Types*: holotype WAM 70.14.

*Type locality*: Hampton Microwave Repeater Tower, 33 miles (53 km) east of Madura, Western Australia, Roe Plain, Pleistocene.

*Material*: holotype and 7 topotypes; 1 specimen from Nurina Cave, surface.

*Stratigraphical range*: Pleistocene of the Roe Plain.

### ***Theridium (Chavanicerithium) wynyardense* (Tate).**

PL. 6, FIGS. 8, 11.

*Potamides pyramidale* Tate, 1885: 226.

*Potamides wynyardense* Tate, 1896: 135, nom. nov. for "*P. pyramidale* Tate non —".

Shell large, biconical, broad, with an apical angle of  $30^\circ$  to  $40^\circ$ , whorls flat, about 10 in

a height of 95 mm, last whorl half height of shell, sculptured with from 10 to 12 large nodular axial ribs on the abapical part of each whorl, weak or absent on the adapical part, and about 10 fine spiral threads per whorl, about 16 over the last whorl and convex base; last whorl with a large variciform swelling above the columella. Shape of the aperture and outer lip not known from the material available; columella concave, columellar lip thickened and reflected over the columella; a parietal ridge on the parietal lip and a small adapical channel.

*Dimensions:* height 95, diameter 53 mm.

*Types:* holotype missing; hypotypes AUGD F 15483, F 15484.

*Type locality:* Table Cape, Tasmania; Table Cape Group, Freestone Cove Sandstone, Longfordian, Lower Miocene.

*Material:* the two hypotypes only. Tate Collection.

*Stratigraphical range:* Lower Miocene (Longfordian) of Table Cape.

The nomenclature of this species is doubtful in all respects. Describing it originally as *Potamides pyramidale*, Tate (1896) changed the name to *P. wynyardense* because the name was preoccupied by an unnamed author. Careful search has so far failed to locate the prior *P. pyramidale*, but Tate's substitute name is tentatively accepted. The generic and sub-generic location of the broadly biconical species is also in doubt, but the available material is too poor and scarce for a firm opinion to be formed. The species has some features in common with the New Zealand Upper Eocene genus *Speightia* Finlay, but there appears to be no evidence of the sinus on the shoulder slope linking the Speightiidae with the Turridae. The apertural features and the variciform swelling on the last whorl link it with the Tertiary cerithiids.

Genus **JETWOODSIA** Ludbrook, gen. nov.

Type species—*Cerithium apheles* Tenison Woods

*Generic characters:* shell turreted or subulate, with a high polystrophic protoconch and numerous whorls which are slightly convex at first but become gradually more convex; axial sculpture dominant, of curved oblique ribs crossed by fine spiral striae, more prominent in the early whorls and tending to become obsolete in the later. Last whorl with a prominent variciform swelling. Aperture ovate,

columellar lip thick and reflected over the columella, a conspicuous parietal ridge and short adapical channel, siphonal canal short, reflected.

The genus is named for the Reverend Father J. E. Tenison Woods, a pioneer of southern Australian geology and palaeontology, who described the species. It seems to have been relatively short lived, first appearing in the Upper Eocene and dying out in the Middle Miocene (Balcombian).

**Jetwoodsia apheles** (Tenison Woods).

PL. 6, FIGS. 1-3.

*Cerithium apheles* Tenison Woods, 1879: 232, pl. XX, fig. 15; Harris, 1897: 224, pl. VII, figs. 1, 2.

Shell fairly large, subulate, with about 24 whorls in a height of 118 mm; first whorls nearly flat, then becoming convex, protoconch of 4 smooth whorls with an erect lip; the first 6 to 8 whorls are sculptured with about 20 axial ribs crossed by 12 fine spiral striae, in the next about 6 whorls the axials weaken or become obsolete, but in the adult stage the axials become fewer and more prominent on the convex whorls where they are usually restricted to the median part of the whorl; both adapically and abapically the whorls are constricted; the early whorls are more or less varicose, the adult costate whorls rarely so except for the last whorl on which there is a large variciform swelling; base convex, last whorl and base with 6 spiral lirae.

Aperture ovate, columella slightly concave, columellar lip thick and reflected over the columella, a conspicuous parietal ridge and short adapical channel, outer lip expanded, slightly thickened, siphonal canal short, reflected.

*Dimensions:* height 118, height of last whorl 26, diameter 23 mm.

*Types:* holotype Australian Museum F 1704; hypotypes British Museum (N.H.) G 4154, AUGD F 15485, F 15489, F 15490.

*Type locality:* Muddy Creek, Hamilton, Victoria; Muddy Creek Marl, Miocene (Balcombian).

*Material:* 19 topotypes, 3 specimens from the Balcombe Clay, Fossil Beach and Schnapper Point. 7 from Gellibrand Marl, Gellibrand River, Victoria.

*Stratigraphical range:* Middle Miocene (Balcombian) of the Otway Basin and Port Phillip Sunkland (Melbourne Basin).

**Jetwoodsia nullarborica** (Chapman & Crespin)

PL. 6, FIGS. 4, 5.

*Cerithium nullarboricum* Tate, 1879b: 107, nom. nud.*Pyrazus aldingense* Tate & Dennant, 1896: 127, nom. nud.*Potamidex nullarboricum* Chapman & Crespin, 1934: 123, pl. XI, figs. 31-33.

Shell rather small, thin, turreted, with a high protoconch of three smooth turns and 15 adult whorls sculptured with narrow slightly oblique curved axial ribs, from 13 to 15 per whorl, and fine microscopic spiral striae and axial growth striae; suture undulating, incised, last whorl with a large variciform swelling, earlier whorls with an occasional varix; base convex to flatly oblique, spirally microscopically lirate.

Aperture obscured or broken in all available specimens, columella concave, columellar lip calloused and reflected over the columella, with a parietal ridge, outer lip expanded.

*Dimensions*: height (estimated) 43, diameter 13 mm.

*Types*: holotype Dennant Collection, National Museum of Victoria, 13674, paratype 13675; hypotypes GSSA M 3237, M 3238.

*Type locality*: Blanche Point, Aldinga Bay, South Australia; Blanche Point Marls, Upper Eocene.

*Material*: 24 topotypes, 1 specimen Kent Town ("Adelaide") Bore.

*Stratigraphical range*: Upper Eocene (Aldinga) Blanche Point Marls of the St. Vincent Basin and Plantagenet Beds of southwestern Australia.

*Nomenclature*: Chapman & Crespin (1934, p. 123) named the species from a Tate manuscript name in the Dennant Collection. The manuscript name *Pyrazus aldingense* given to the species in the Tate Collection, University of Adelaide, was published in Tate and Dennant's list (1896) of the Eocene fossils from Aldinga and Adelaide.

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## EXPLANATION OF PLATES

## PLATE 1

All figures X 1

- 1, 2. *Diastoma costellatum* (Lamarck). AUGD F 15487, Middle Eocene, Lutetian, Chaussy.  
 3-7. *Diastoma adelaidense* Ludbrook. 3, 4. GSSA M 609A, holotype; Upper Pliocene, Dry Creek Sands, sec. 353, hd. Yatala, 420-499 feet (127-151 m); 5, 6. WAM 69.487, paratype, Pleistocene of the Roe Plain, Hampton Microwave Repeater Tower; 7. paratype, GSSA M 611, Kooyonga Golf Club Bore 1932.  
 8-11. *Diastoma provisi* Tate. 8. AUGD T 1541B, Upper Pliocene, Dry Creek Sands, Dry Creek Bore, sec. 980, hd. Port Adelaide, 320-400 feet (97-121 m); 9. AUGD T 1541G, hypotype from type series; 10. AUGD T 1541E hypotype from type series; 11. GSSA M 2727, hypotype, Upper Pliocene, Dry Creek Sands, Kooyonga Golf Club Bore 4, sec. 2028, hd. Adelaide, 500 feet (152 m).  
 12-16. *Diastoma melanioides* (Reeve). Pleistocene of the Roe Plain; 12. GSWA F 6920(2); 13. GSWA F 6920 (1); 14. WAM 70. 1088, 0.4 miles (0.65 km) north of Hampton Microwave Repeater Tower; 15. GSWA F 6920 (1); 16. GSWA F 6920 (3) locality 5439, 13 miles (21 km) NE of Eyre.  
 17-21. *Diastoma melanioides* (Reeve). Recent; 17-20 from type locality Esperance; 17. SAM D 14997; 18. D 14994, with broken aperture; 19. WAM 70.1145 a; 20. SAM D 14995; 21. SAM D 14996 St. Francis Island, South Australia.

## PLATE 2

All figures X 2/3

- 1-7. *Campanile symbolicum* Iredale. 1-2. Recent GSSA M 3239, dead specimen, Israelite Bay, 1. showing surface pattern of borings; 2. axial section, only one side of shell is extensively bored, presumably where it has been lying in the substratum; 3-7. Pleistocene of the Roe Plain; 3. WAM 69.384, 25 miles (40 km) east of Madura; 4. 61.54 B, juvenile showing sculpture on early whorls, 20 miles (32 km) east of Madura; 5. GSSA M 2564, Madura Cave, intermediate between *C. triseriale* Basedow and *C. symbolicum* in its retention of 3 faint spiral ribs on the whorls; 6. GSSA M 3240, axial section showing shell and part of the columella extensively bored and giving the appearance of primary shell structure, Madura Cave; 7. GSSA M 3231 showing surface pitting and cellular under layer due to extensive boring, 0.4 miles (0.65 km) north of Hampton Microwave Repeater Tower.

## PLATE 3

Figures 1-4, X 1, figure 5, X 0.5

- 1, 4. *Campanile triseriale* Basedow, Upper Pliocene, Hallett Cove Sandstone; 1. AUGD F 15480 Edithburg, topotype; 4. AUGD F 15481 Hallett Cove.  
 2, 3. *Campanile virginianse* Ludbrook, Upper Pliocene, Dry Creek Sands; 2. GSSA M 2360, holotype, Observation Bore A, Virginia, sec. 3036, hd. Munno Para, 209-217 feet (63.3-65.8 m); 3. GSSA M 2013, paratype, F. Virgin Bore, Sec. 3224, hd. Munno Para, 338-350 feet (102-106 m).  
 5. *Campanile* sp. Lower Miocene, Nullarbor Limestone, WAM 10448, Forrest, Western Australia, Western Australian Museum photo.

## PLATE 4

All figures X 1

- 1-4. *Theridium (Chavanicerithium) pritchardi* (Harris); 1-3, from type locality, Table Cape Tasmania, Table Cape Group, Freestone Cove Sandstone, Longfordian, Lower Miocene; 1. AUGD T 356; 2, 3. AUGD F 15488; 4. AUGD F 15482, from "Murray Desert", i.e. Bookpurnong Beds, Lower Pliocene (? Upper Miocene), boring at Tareena, New South Wales.  
 5-6, 9-10. *Theridium (Chavanicerithium) flemingtonense* (McCoy), all latex casts; 5-6, 10, from Newport Formation, ? Ralcombian, Middle Miocene; 5. NMV P 27981, Flemington; 6. NMV P 16381, West Essendon, figd. Gill & Baker, 1955; 10. NMV P 27984 West Essendon; 9. GSSA M 3234 upper part of Melton Limestone, old flux quarry, Wallaroo, South Australia.  
 7-8. *Theridium (Chavanicerithium) adelaidense* (Howchin & Cotton), Upper Pliocene, Dry Creek Sands; 7. GSSA M 765A, Cowandilla Bore, sec. 92, hd. Adelaide, 485-507 feet (147-154 m); 8. GSSA M 643, Kooyonga Bore 1932, sec. 2028, hd. Adelaide, 491-501 feet (149-152 m),

## PLATE 5

All figures X 1

- 1, 2. *Thericium (Chavanicerithium) torri* (Tate), "Murray Desert", i.e. Bookpurnong Beds, Lower Pliocene (? Upper Miocene); 1, AUGD T 1618, holotype, Boring at ? Mindarie, South Australia; 2, AUGD T 832, paratype, boring at ? Tareena, New South Wales.
- 3, 4. *Thericium (Chavanicerithium) tatei* Ludbrook, Upper Pliocene, Dry Creek Sands; 3, GSSA M 3224, holotype, Observation Bore A, Virginia, sec. 3036, hd. Munno Para, 209-217 feet (63.3-65.8 m); 4, AUGD F 15486, paratype, A. H. Kinnish, Direk, Bore 2, sec. 3076, hd. Munno Para, 265 feet (80 m).
- 5, 6. *Thericium (Chavanicerithium) westraliense* Ludbrook, Pleistocene of the Roe Plain; 5, WAM 70.14, holotype, Hampton Microwave Repeater Tower; 6, WAM 70.1133 paratype, same locality.
- 7, 8. *Thericium (Chavanicerithium) darraghi* Ludbrook, Pleistocene of the Roe Plain; WAM 69.547, 0.4 miles (0.65 km) north of Hampton Microwave Repeater Tower.
9. *Thericium (Chavanicerithium) sp.cf. T. (C.) darraghi* Ludbrook, Pleistocene of the Roe Plain, WAM 69.483, Hampton Microwave Repeater Tower.

## PLATE 6

All figures X 1

- 1-3. *Jetwoodsia upheles* (Tenison Woods), Balcombian, Middle Miocene, Victoria; 1, AUGD F 15485, Balcombe Clay, Fossil Beach, Mornington; 2 AUGD F 15489, Muddy Creek Marl, Muddy Creek, Hamilton, juvenile, close to holotype; 3, AUGD F 15490 Muddy Creek Marl, showing varicate early whorls and development of sculpture.
- 4, 5. *Jetwoodsia nullarborica* (Chapman & Crespin), Aldingan, Upper Eocene, Blanche Point Marls, Blanche Point, Aldinga Bay; 4, GSSA M 3238; 5, GSSA M 3237.
- 6, 7. *Thericium (Thericium) fallax* Ludbrook, Upper Pliocene, Dry Creek Sands, GSSA M 2730, De Ruro Bore, Waterloo Corner, sec. 4259, hd. Munno Para, 240-245 feet (72.8-74.3 m).
- 8, 11. "*Thericium (Chavanicerithium) wynyardense*" (Tate); Longfordian, Lower Miocene, Table Cape Group, Freestone Cove Sandstone, Table Cape, Tasmania; 8, AUGD F 15484 juvenile; 11, AUGD F 15483.
- 9, 10. *Diastoma adalaidense* Ludbrook; Lower to Middle Miocene, upper part of Melton Limestone, Wallaroo, latex casts; 9, GSSA M 3241; 10, GSSA M 3242.